Total No. of printed pages = 8

RETEST EXAMINATION–2019

Semester : 3rd

Subject Code : Sc-303

MATHEMATICS – III

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instruction :

1. *All* questions of PART–A are compulsory.
2. Answer any *five* questions from PART–B.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

   (a) If $z = f(x, y)$ partial derivative of z with respect to x is denoted by _____.

   (b) Number of independent variables in an ordinary differential equation is _____.

[Turn over

(c) The degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = k\frac{d^2y}{dx^2}$ is _____.

(d) Integrating Factor of $x\frac{dy}{dx} - 3y = x^2$ is _____.

(e) A differential equation $Mdx+Ndy=0$ is said to be Exact if _____.

(f) An equation of the form $y = px + f(p)$ is known as _____.

(g) The Auxiliary Equation of $[aD^2+bD+c]y = e^x$ is _____.

(h) The Particular Integral of $[D^2+1]y = x^2$ is _____.

(i) The range of the observations : 32, 28, 31, 53, 20, 33, 38, 56, 43, 40 is _____.

(j) The sample space in the throw of a dice is _____.

2. Write true or false : 1×10=10

(a) If $z = x^2\sin(xy)$, then $\frac{\partial z}{\partial y} = x^2\cos(xy)$

(b) A differential equation is an equation that involves differential coefficients.

(c) $y = A\cos x - B\sin x$ is a solution of the differential equation $\frac{d^2y}{dx^2} + y = 0$.

(d) If A is a singular matrix, then A^{-1} exists.

(e) Equations reducible to homogeneous form is called Bernoulli's equation.

(f) Diagrammatic representation of bivariate data is called Scatter Diagrams.

(g) Coefficient of correlation and coefficient of variation are related quantities.

(h) The probability that a leap-year selected at random will contain 53 Sundays is '2/7'.

(i) The transpose of a $m \times n$ matrix has 'm' rows and 'n' columns.

(j) If A is a non singular square matrix, then $|A| \neq 0$.

3. Choose the correct answer : 1×5=5

(a) For a square matrix A, $A - \lambda I$ is the

(i) Characteristic equation of A

(ii) Characteristic matrix of A

(iii) Characteristic polynomial of A

(iv) None of the above

(b) Two points belonging to the solution set of $2x + 3y \leq 6$ are

(i) (2,0), (3,0) (ii) (0,2), (0,3)

(iii) (0,0), (3,1) (iv) (0,0), (2,1)

(c) The Optimal Value means

(i) Maximum value

(ii) Minimum value

(iii) Maximum or Minimum value

(iv) None of the above

(d) The solution of $\text{Cos}x = \text{Sin}x$, $0 \leq x \leq \frac{\pi}{2}$ is

(i) $\frac{\pi}{3}$ (ii) $\frac{\pi}{6}$

(iii) $\frac{2\pi}{3}$ (iv) $\frac{\pi}{4}$

(e) The graphs of trigonometric functions are

(i) curves

(ii) straight lines

(iii) both curves and straight lines

(iv) None of the above.

PART – B

Marks – 45

4. (a) If $z = f(ax + by)$, show that $b\frac{\partial z}{\partial x} - a\frac{\partial z}{\partial y} = 0$.

(b) Form a differential equation :

$y^2 = Ax^2 + Bx + C$

(c) Solve : $\left(x^2 + x + 1\right)dx + \left(y^2 + y + 1\right)dy = 0$

5. Solve the following : 3×3=9

(a) If $u = \left(x^2 + y^2 + z^2\right)^{-\frac{1}{2}}$

show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial x} + z\frac{\partial u}{\partial x} = -u$

(b) $\left(x^2+y^2\right)dx = 2xydy$

(c) $(x+1)\frac{dy}{dx} - y = e^x(x+1)^2$

6. (a) Solve : $\frac{dy}{dx} + y\cot x = \cos x$

(b) Solve the following simultaneous linear equation : $3x + 4y = 5$; $2x - 7y = 1$

(c) $\frac{d^2s}{dt^2} + 4\frac{ds}{dt} + 13s = 0$ $3\times3=9$

7. Solve the following : $3\times3=9$

(a) $(12x+5y-9)dx + (5x+2y-4)dy = 0$

(b) $xy(p^2+1) = (x^2+y^2)p$

(c) Solve: $(D^3 - 3D^2 + 3D - 1)y = e^{2x} + \sin x$

8. (a) Find the Mean and Mode from the following data : 6

Class :	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Freq. :	4	24	21	13	5	3	5	8	2

(b) Draw the graph of $y = \sin x$, $-\pi \le x \le \pi$ 3

9. (a) Find the Mean Deviation from Median : 5

Marks :	0-10	10-20	20-30	30-40	40-50
No. of students :	5	8	15	16	6

(b) Solve graphically : $\cos x = 2x$ 4

10. (a) Find the Quartile Deviation of the following distribution : 6

Class :	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Freq. :	15	20	25	24	12	31	71	52

(b) Maximise $z = 2x + y$. Subject to $x + y \le 1$, $2x + 3y \ge 6$, $x \ge 0$, $y \ge 0$. 3

11. (a) Calculate the coefficient of correlation from the % of marks obtained by 10 students in Economics and Statistics : 6

Roll No. :	1	2	3	4	5	6	7	8	9	10
Marks in Eco :	78	36	98	25	75	82	90	62	65	39
Stats :	84	51	91	60	68	62	86	58	53	47

(b) Find the probability that a card drawn from a pack of 52 cards be either a king or a spade. 3

12. (a) The current 'i' in a circuit having a resistance R, an inductance L and e.m.f. E is given by $L\frac{di}{dt}+Ri=E$. If initially the current be zero, find 'i' at any time 't'. 4

(b) Find the Adjoint and the Inverse of the matrix 5

$$A=\begin{pmatrix}1 & 3 & 2\\ 5 & -2 & 6\\ 0 & 0 & 4\end{pmatrix}$$